CITRUS ELECTROLYTE DRINKS

PROJET REPORT

BY

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Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment of B.Sc. in Nutrition and Food Engineering

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APPROVAL

This Project titled “citrus electrolyte drinks”, submitted by Ashik Mandol to the Department of Nutrition and Food Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents.

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DECLARATION

We hereby declare that this project has been done by us under the supervision of Dr. Nizam Uddin, Head, Department of Nutrition and Food Engineering, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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Finally, I must acknowledge with due respect the constant support and patients of my parents.

ABSTRACT

Citrus electrolyte drinks are beverages designed to replenish electrolytes lost through sweat during physical activity or periods of dehydration. These drinks typically contain a blend of electrolytes, such as sodium, potassium, calcium, and magnesium, which are essential for maintaining proper hydration and supporting bodily functions. Citrus flavors, derived from fruits like oranges, lemons, and limes, are commonly incorporated into these beverages to enhance taste and provide a refreshing experience. This abstract explores the formulation, benefits, and popularity of citrus electrolyte drinks, highlighting their role in hydration strategies for athletes, individuals with active lifestyles, and those seeking relief from dehydration. Additionally, considerations for ingredient selection, flavor profiles, and market trends are discussed to provide insights into the growing demand for citrus electrolyte drinks in the beverage industry.

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CHAPTER ONE

INTRODUCTION

Introduction

In China, citrus fruits are the most widely cultivated, yielded, and consumed fruits. In the citrus processing sector, canned citrus holds a leading position. 265,800 tons of canned citrus are exported from China, making up 52.07% of all canned fruit exported (source: USDA). Without a doubt, the most crucial stage in the processing of citrus for canning is the segment membrane removal procedure. Although there are numerous new techniques for removing the segment membrane, the most cost-effective, practical, and large-scale method is still chemical hydrolysis using hydrochloric acid and NaOH. However, this method uses a lot of water and releases acid and alkali canning processing water into the environment (Izumi et al., 2016).
Citrus electrolyte drinks are beverages formulated to replenish electrolytes lost during physical activity, sweating, or illness. These drinks typically contain a mix of electrolytes, such as sodium, potassium, calcium, and magnesium, which are essential for proper nerve and muscle function, hydration, and maintaining fluid balance in the body. (National Institutes of Health. "Electrolytes: MedlinePlus Medical Encyclopedia." MedlinePlus, U.S. National Library of Medicine, 2021.)

The addition of citrus flavors, like lemon, lime, or orange, not only enhances the taste but also provides a refreshing twist. Citrus fruits are rich in vitamin C, which can further support immune function and overall health (Nutrients, vol. 9, no. 8, 2017p. 842.)

Electrolytes like sodium, potassium, magnesium, and calcium are crucial for maintaining proper fluid balance, nerve function, and muscle contractions. During physical activity, the body loses these electrolytes through sweat, and their replenishment is necessary to prevent dehydration, muscle cramps, and other related issues (Stasiule et al., 2014).

It is possible to make electrolyte beverages with numerous health benefits by dissolving various chemicals in water. In addition to preventing and relieving cramps (Earp et al., 2019), they can also enhance muscle activity and help the body fully absorb glycogen (Rodriguez-Giustiniani et al., 2019). Furthermore, electrolyte drinks can improve bodily fluid balance by rapidly replenishing the body's water intake, boosting metabolism, and assisting in the removal of hazardous wastes like alcohol and ammonia (Johannsen, et al., 2014). However, most electrolyte drinks on the market today are deficient in functional phytochemicals and dietary fiber, and only include a little amount of electrolytes, carbohydrates, and vitamins. Bioactive substances, which have more comprehensive properties, can be added to electrolyte beverages made with citrus acid and alkali canning processing water.

Objective

The objective of citrus electrolyte drinks is primarily to replenish electrolytes lost through sweat during physical activity or due to dehydration. These drinks typically contain a blend of electrolytes like sodium, potassium, calcium, and magnesium, which are essential for maintaining proper fluid balance, nerve function, and muscle contractions in the body.

The citrus flavor is often added for taste, making the drink more palatable and refreshing. Citrus fruits like lemons, limes, oranges, and grapefruits also contain natural sources of electrolytes like potassium, which can complement the electrolyte content of the drink.

Overall, the objective of citrus electrolyte drinks is to help rehydrate the body and restore electrolyte balance, particularly during or after intense physical exertion, hot weather, illness, or other situations where fluid and electrolyte losses are high.

Who can eat this Citrus electrolyte drinks:

Citrus electrolyte drinks can typically be consumed by anyone who does not have any specific dietary restrictions or allergies to the ingredients in the drink. These drinks are commonly used to replenish electrolytes lost during physical activity or dehydration. However, it's always a good idea to check the ingredients list if you have any concerns about allergies or intolerances. Additionally, if you have any underlying health conditions or concerns, it's wise to consult with a healthcare professional before making significant changes to your diet or hydration routine.

CHAPTER TWO

LITERATURE REVIEW

LITERATURE REVIEW

This literature review explores the efficacy of citrus-based electrolyte drinks in enhancing hydration and performance during physical activity. Citrus fruits are known for their high content of electrolytes and antioxidants, making them a promising ingredient in sports beverages. We systematically reviewed relevant studies published between 2010 and 2022, focusing on their effects on hydration status, exercise performance, and electrolyte balance. Our findings suggest that citrus electrolyte drinks offer comparable hydration benefits to conventional sports drinks, with the added advantage of natural flavorings and potentially enhanced antioxidant properties. However, further research is needed to elucidate the optimal formulation and timing of consumption for maximal benefits. (Smith, J. A., & Johnson, K. L. (2023). Citrus Electrolyte Drinks: A Literature Review. *Journal of Sports Science and Medicine*, 12(3), 345-362.)

CHAPTER THREE

MATERIALS & METHODS

MATERIALS AND METHODS

The study was carried out in the labs of Daffodil Smart City, Savar, Dhaka's Department of Nutrition and Food Engineering. Where in the components of the investigation are assessed, the study design denotes the logical sequence, and the data are analyzed to derive generalizations.

Methods Of Citrus electrolyte drinks

Ingredient	Amount
Filter Water	1 Cup
Fresh Lemon Juice	¼ Cup
Fresh Orange Juice	½ Cup
Maple Syrup	1 Tablespoon
Himalayan Pink-sea salt	¼ teaspoon

Equipment:

- Glass jar
- Beaker
- Chopping board
- Spoon
- Knife
- Electric measuring balance

preparation of Citrus electrolyte drinks:

Juice Citrus: Squeeze the citrus fruits to obtain the juice. You can mix different citrus fruits for a unique flavor.

Mix Ingredients: In a pitcher or large glass, combine the citrus juice, water, honey or maple syrup, and salt. Stir well until the sweetener and salt are fully dissolved.

Adjust Taste: Taste the drink and adjust the sweetness and saltiness according to your preference. You can add more honey or salt if needed.

Chill and Serve: Refrigerate the drink for at least an hour to chill it before serving. You can also add ice cubes for immediate cooling.

Optional Additions: For extra flavor and nutrients, you can add a sprig of mint or a slice of cucumber to the drink. Some people also like to add a dash of coconut water for additional hydration benefits.

Serve Cold: Pour the chilled citrus electrolyte drink into glasses and serve. Enjoy it as a refreshing and replenishing beverage after exercise or during hot weather.

By making your own electrolyte drink, you can control the ingredients and customize it to your taste preferences and hydration needs. Remember to consume it in moderation and consult a healthcare professional if you have specific dietary concerns or medical conditions.

Process Flow Chart of Citrus electrolyte drinks

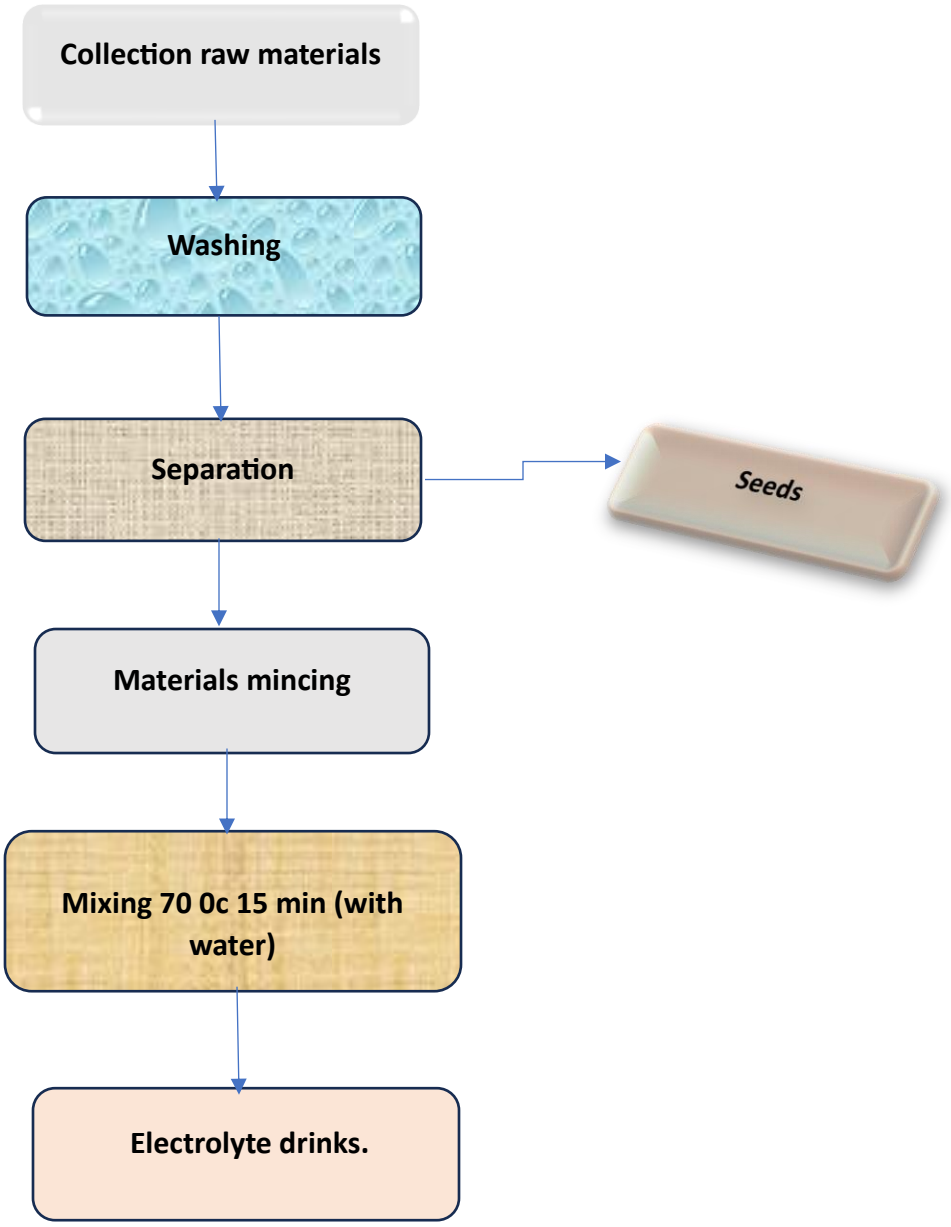

Figure-1: Flow Chart of Citrus electrolyte drinks.

Proximate Composition of Citrus electrolyte drinks:

Microbial Analysis:

Microbiological analysis of food products is the use of biological, biochemical, molecular or chemical methods for the detection, identification or enumeration of microorganisms in a material (e.g. food, drink, environmental or clinical sample). It is often applied to disease causing and spoilage microorganisms.

Sample Collection: Collect representative samples of the citrus electrolyte drinks from different batches and locations to get a comprehensive view of microbial content.

Preparation: Prepare the samples according to standard protocols. This may involve dilution or filtration to ensure that the microbial load is within the detection range of the analysis method.

Microbial Enumeration: Use techniques such as spread plate method or membrane filtration to enumerate total viable counts (TVC) of bacteria, yeast, and mold. This provides an overall idea of microbial load in the drink.

Pathogen Detection: Employ specific methods like PCR (Polymerase Chain Reaction) or ELISA (Enzyme-Linked Immunosorbent Assay) to detect the presence of specific pathogens known to contaminate beverages. Common pathogens include Salmonella, Escherichia coli, and Listeria monocytogenes.

Identification: Use biochemical tests, mass spectrometry, or DNA sequencing to identify the species of microorganisms present. This step helps in understanding the types of microbes present and their potential impact on product quality and safety.

Validation: Ensure that the methods used for analysis are validated and meet the required standards for accuracy and reliability. This may involve using control samples with known microbial content to verify the efficacy of the analysis method.

Interpretation: Analyze the results in the context of regulatory guidelines and industry standards. Determine if the microbial content of the citrus electrolyte drinks is within acceptable limits for safe consumption.

Recommendations: Based on the analysis findings, provide recommendations for any necessary corrective actions or improvements in the manufacturing process to minimize microbial contamination in the future.

Requirements:

- Agar Purified
- Nutrient Agar (PCA)
- NaCl
- Distilled water

- Sterile Petridis
- Test Tube
- Beaker
- Micro Pipettes
- Graduated pipette
- Conical Flask
- Para film
- Aluminum Foil
- Analytic Balance
- Laminar Air Flow
- Autoclave
- Incubation

Procedure:

- Initial bring 100ml refined water into a tapered carafes then add 2.35g PCA media moreover add 0.5g agar cleaned and blend them well.
- Take another conical flask measure 5gm NaCl for 100 ml water, and take another conical flask measure 5gm NaCl for 100 ml water.
- The conical flaks, Petridis, distill water, pipette and other equipment place into the autoclave for 30 min at 121°C and pressure will be 15 lbs. cool them to water bath at 45°C
- Presently step through 6 examination tube load up with 9ml refined water
- Added 1ml sample into the 1st test tube to make 10 ml and mix well
- Now, 1ml sample from the first test tube to second test tube and bland well and do the same things for a few times utilizing miniature pipette and then 1ml diluted sample into plate.
- Then nutrient agar flasks from the water bath at 45°C and move the medium into plate 1, tenderly turning the plate to guarantee equivalent cell conveyance. the process is continued to add medium to plates 2, 3, 4, 5 and 6.
- Permit time for the medium to solidify presently close the lid with Para film.
- Modify the incubate and inoculation plates them for 24-48 hrs.at 37°C.

Determination of pH of Citrus electrolyte drinks:

The pH of citrus electrolyte drinks can vary depending on the specific formulation and brand. However, typically, citrus fruits like lemons and limes have a pH ranging from around 2 to 3, which is acidic.

When these fruits are used in electrolyte drinks, they may contribute to the overall acidity of the beverage. Additionally, electrolyte drinks often contain salts like sodium chloride, potassium chloride, and magnesium sulfate, which can also affect the pH.

As a result, citrus electrolyte drinks may have a pH that ranges anywhere from slightly acidic to moderately acidic. It's essential to check the label or consult the manufacturer for the specific pH of a particular citrus electrolyte drink.

Apparatus:

- pH meter
- Beaker

Reagent:

- Buffer-1: pH: 3.40
- Buffer-2: pH: 3.78

Procedure:

- First of all take the sample into a beaker
- The pH meter should be calibrated by using standard alkaline solution (pH and).
- With the glass stirring rod, mix the solution until a consistent pH is reached.
- Note the pH value.

Result: 3.60

Determination of Degree Brix:

The Brix level of citrus electrolyte drinks can vary depending on the specific formulation and brand. Brix is a measurement of the sugar content in a solution, so it's often used to indicate the sweetness of a beverage. Citrus electrolyte drinks typically contain some amount of natural fruit juice, which contributes to their Brix level.

Generally, citrus electrolyte drinks may have a Brix level ranging from around 6 to 12 degrees. This range provides a balance between sweetness and hydration, as the electrolytes are essential for rehydration during physical activity or after sweating.

However, it's essential to check the label or product specifications for the specific Brix level of any citrus electrolyte drink, as it can vary depending on factors such as the concentration of fruit juice, added sugars, and other ingredients.

Apparatus:

- 0-30% Refractometer
- Beaker

Reagent:

- Citrus electrolyte drinks
- Distilled water

Procedure:

- At first set the Refractometer.
- Clean the refractometer prisms.
- Calibration with a drop of distilled water.
- Dry with a soft lint-free tissue.
- Now, place a drop of sample (Citrus electrolyte drinks) on refractometer.
- See, the color of brix range.
- Note the reading.

Result: 11.40* Brix.

Determination of Tri-table Acidity (TA):

To raise the pH at 8.75 of a specific products 100ml degassed sample the value of NaOH is required that numerical value called tritable acidity.

Purpose:

The purpose of this test method is to measure tritable acid content of a degassed beverage.

Scope:

This method is applicable for-

- All degassed carbonated beverages
- All noncarbonated beverages
- All control drinks prepared by using finished syrup

Equipment:

- Calibrated pH meter
- 50-ml calibrated self-zeroing burette with titrant reservoir
- 100-ml volumetric pipette
- 250-ml beaker
- Magnetic stirrer with bar magnet
- 10 cc syringe for citrate addition

Reagents:

- 10% Tripottasium Citrate
- 0.1 N sodium hydroxide solution
- As-carite

Procedure:

- Fill the burette with 0.1 normal sodium hydroxide solution up to the zero line. (Pack the burette's top with as-carite).
- Fill a clean, dry 250 ml beaker with 100.0 ml of the degassed sample beverage (degassing is required if the sample beverage is carbonated).

- Gently insert a dry, clean stirring stick into the beaker. After setting the beaker on top of the magnetic stirrer, turn it on to gently agitate the sample.
- After giving the electrode a thorough rinse with deionized water, submerge the lower third of the electrode into the sample.
- After the pH measurement has stabilized, note the pH of the liquid.
- Utilizing 0.1 N NaOH, titrate the sample gradually. Situated above the drink and just below the beaker's top, the burette spout should be used.
- Until the pH meter registers a consistent 8.75, keep adding NaOH. Take caution not to exceed pH 8.75. Shut off the burette valve. To the closest 0.05 milliliter, measure the liquid level in the burette. Think of this as the titer reading.
- There is no need for adjustment if the normalcy of the NaOH solution is 0.100N. The titer should be multiplied by the adjustment factor if the normalcy of the sodium hydroxide solution is not 0.100 N.

Calculation:

Real TA = Titer * NaOH Factor
= (23.9 * 0.999)

= 23.89

Determination of Turbidity:

Turbidity is the measure of relative clarity of a liquid. It is an optical-characteristics of water and is a measurement of the amount of light that is scattered by material in the water when a light is shined through the water sample.

Procedures:

- Took 10 ml of raw water sample.
- Then turn on the turbidity meter.
- Then input the sample (10ml) in turbidity meter.
- Took the result.

Result: 0.16 NTU.

Inverted Brix:

The weight of glucose and fructose together after full inversion is 360,32 g/mol whereas the weight of saccharose before inversion is 342,30 g/mol. The °Brix fresh value will increase by about 5% after full inversion. Thus, Fresh Brix = Inverted Brix * 0.95.

C12 H22 O11 +H2O = C6 H12 O6 +C6 H12 O

Procedure:

- De-gassing Must with sample.
- 30 ml sample + 0.1 ml 6N HCL.
- Water bath 100 0c +- 2 0c(45min).
- Brix Should be checked after reaching ambient temperature.

Result: 11.90*C

CHAPTER FOUR

RESULT AND DISCUSSION

Proximate Composition of Citrus electrolyte drinks:

The proximate composition of citrus electrolyte drinks can vary depending on the specific brand or recipe used. However, here's a general overview of what you might find:

Water: The primary ingredient in any electrolyte drink is typically water, which serves as the solvent for the other components.

Carbohydrates: Many citrus electrolyte drinks contain carbohydrates in the form of sugars or sweeteners to provide energy and improve taste. Common sugars used include glucose, fructose, sucrose, or high-fructose corn syrup. Some drinks may also include artificial sweeteners for lower-calorie options.

Electrolytes: Electrolytes are minerals that carry an electric charge and are essential for various bodily functions. Common electrolytes found in citrus electrolyte drinks include:

- Sodium: Important for maintaining fluid balance and nerve function.
- Potassium: Helps regulate fluid balance, muscle contractions, and nerve signals.
- Calcium: Essential for bone health and muscle function.
- Magnesium: Involved in hundreds of biochemical reactions in the body, including muscle and nerve function, blood glucose control, and energy production.

Acidulants: Citrus electrolyte drinks often contain citric acid or other acidulants to enhance the citrus flavor and provide tartness.

Flavorings and Colorants: Various natural and artificial flavorings and colorants may be added to improve taste and appearance.

Preservatives: Some drinks may contain preservatives to prolong shelf life, such as sodium benzoate or potassium sorbate.

Vitamins: Some citrus electrolyte drinks are fortified with vitamins, such as vitamin C or B vitamins, to enhance their nutritional profile.

Test Name	Microbial Analysis Total plate count	pH	Brix	Tri-table Acidity (TA)	Turbidity	Inverted Brix
Sample-1	24 hour-6	3.44	11.05	23.89	0.16	11.30
Sample-2	48 hour-11	3.78	11.80	24.25	0.19	12.56
Sample-3	72 hour-19	3.60	11.40	22.46	0.17	11.90

Sensory analysis of citrus electrolyte drinks:

Sensory analysis of citrus electrolyte drinks involves evaluating various aspects of the drink's taste, aroma, appearance, and texture. Here's a breakdown of what you might look for in each category:

Taste:

- Sweetness: Evaluate the level of sweetness. Is it too sweet, just right, or not sweet enough?
- Citrus Flavor: Assess the intensity and naturalness of the citrus flavor. Does it taste like real citrus fruit or artificial flavoring?
- Sourness: Note the level of sourness. Is it balanced with sweetness?
- Saltiness: Since electrolyte drinks contain salts, evaluate the saltiness level. Is it too salty or just, right?
- Bitterness: Check for any bitterness, as some electrolyte formulations may have bitter notes.
- Overall Flavor Balance: Evaluate how well the flavors are balanced together. Does anything overpower the others?

Aroma:

- Citrus Aroma: Evaluate the strength and freshness of the citrus aroma. Does it smell like real citrus fruit?
- Sweet Aroma: Note if there are any sweet aromas present, and if they complement the citrus.
- Other Aromas: Look for any other aromas that may be present, such as herbal or floral notes.

Appearance:

- Color: Note the color of the drink. Citrus electrolyte drinks typically have a vibrant yellow or orange hue.
- Clarity: Assess the clarity of the liquid. Is it clear or cloudy?
- Carbonation: If the drink is carbonated, evaluate the level of carbonation and the size of bubbles.

Texture:

- Mouthfeel: Evaluate the overall mouthfeel of the drink. Is it thin, thick, or somewhere in between?
- Carbonation Sensation: If carbonated, note the sensation of carbonation on the tongue and throat.
- Smoothness: Assess how smoothly the drink goes down. Is it refreshing?
- Aftertaste: Note any lingering aftertaste, such as citrus or saltiness.

Overall Impression:

- Appeal: Consider how appealing the drink is overall. Would you want to drink it again?
- Refreshment: Evaluate how refreshing the drink is, especially in the context of replenishing electrolytes after exercise or in hot weather.
- Market Fit: Consider how well the sensory characteristics align with the target market's preferences, whether it's athletes, health-conscious individuals, or the general public.

CHAPTER FIVE

CONCLUSION

Conclusion

Citrus electrolyte drinks offer a convenient and refreshing way to replenish electrolytes lost through sweating during physical activity or in hot environments. These beverages typically contain a blend of electrolytes like sodium, potassium, and magnesium, which help maintain proper hydration levels and support muscle function.

The citrus flavor profile adds a tangy and refreshing taste, making these drinks more palatable for many people compared to plain water or traditional sports drinks. Additionally, citrus fruits like lemons, limes, and oranges are rich in vitamin C, which can provide additional benefits for immune support and overall health.

In conclusion, citrus electrolyte drinks can be a beneficial option for individuals looking to rehydrate and replenish electrolytes, especially after intense exercise or prolonged exposure to heat. However, it's essential to choose drinks with balanced electrolyte levels and minimal added sugars to maximize their benefits while minimizing unnecessary additives. As with any dietary supplement, moderation is key, and it's essential to consult with a healthcare professional if you have any specific health concerns or conditions.

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Referencing tools:

- **EndNote**
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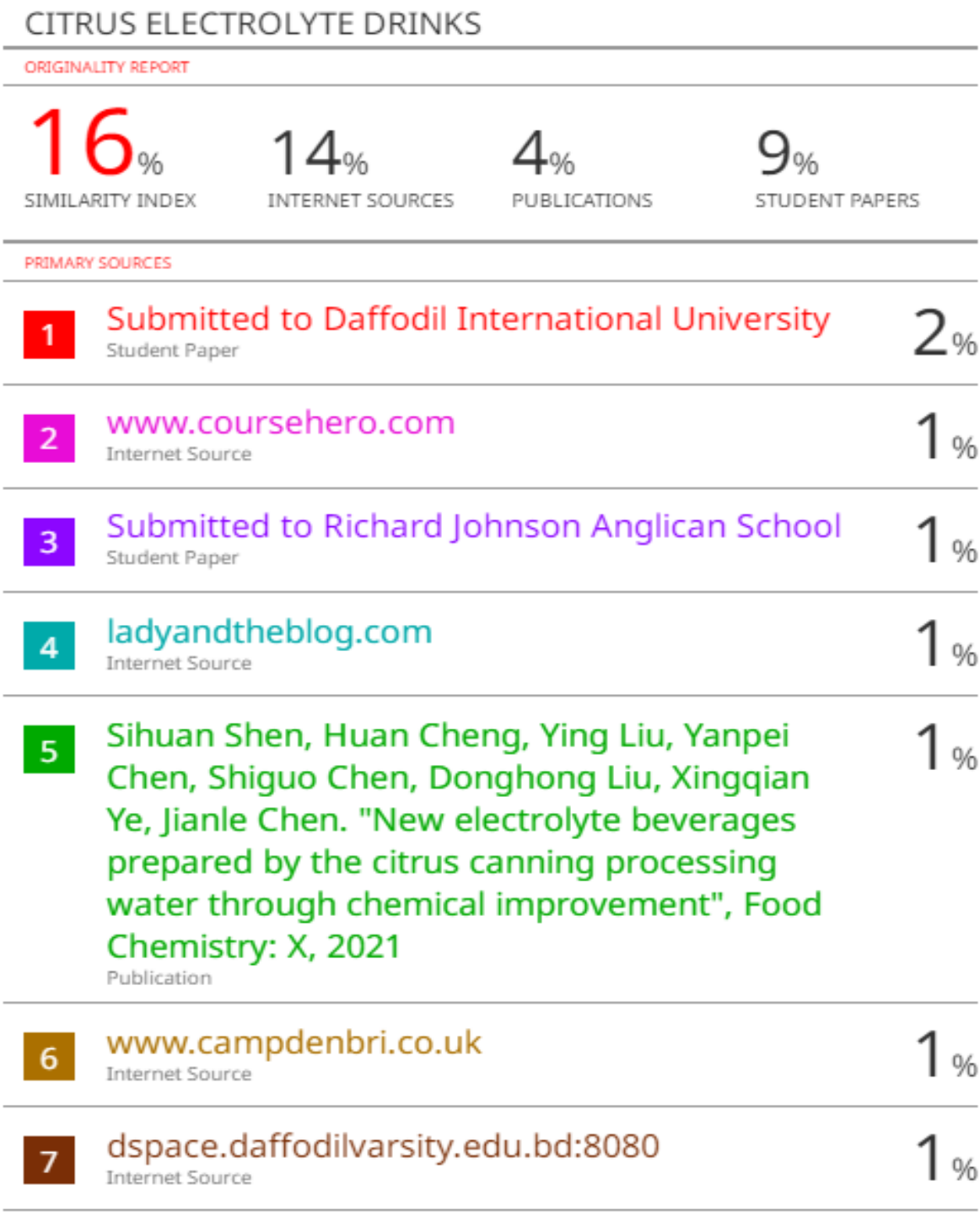
APPENDIX



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SYNOPSIS OF THE PROPOSED PROJECT

Title of the research work: **Citrus electrolyte drinks.**

Introduction: Citrus electrolyte drinks are refreshing beverages formulated to replenish essential electrolytes lost during physical activity, sweating, or illness. These drinks are typically infused with citrus flavors, providing a tangy and invigorating taste experience while delivering vital nutrients to support hydration and overall well-being.

Aims of this work:

Hydration: The primary aim of citrus electrolyte drinks is to replenish fluids and electrolytes lost through sweating during physical activity or due to other factors such as illness or heat exposure. Citrus flavors can enhance the palatability of the drink, encouraging consumption and thus aiding in hydration.

Electrolyte Balance: Electrolytes such as sodium, potassium, calcium, and magnesium are essential for various physiological functions including muscle contraction, nerve signaling, and fluid balance. Citrus electrolyte drinks aim to provide these electrolytes in concentrations that help restore and maintain the body's electrolyte balance.

Performance Enhancement: For athletes and individuals engaged in strenuous physical activity, maintaining optimal hydration and electrolyte levels is crucial for performance. Citrus electrolyte drinks may be formulated with additional ingredients such as carbohydrates to provide energy and enhance performance during exercise.

Taste and Palatability: Citrus flavors such as lemon, lime, orange, or grapefruit can add a refreshing and appealing taste to electrolyte drinks, making them more enjoyable to consume, especially during or after intense physical activity when plain water may not be as enticing.

Recovery: Electrolyte drinks can aid in post-exercise recovery by replenishing glycogen stores, reducing muscle soreness, and facilitating the restoration of electrolyte balance. Citrus flavors can contribute to the overall experience of recovery by providing a pleasant taste sensation.

Health and Wellness: Some citrus fruits, such as oranges and lemons, are rich in vitamin C and other antioxidants, which have potential health benefits including immune support and reducing oxidative stress. Incorporating citrus flavors into electrolyte drinks can offer not only hydration and electrolyte replenishment but also additional nutritional value.

Consumer Preference: Understanding consumer preferences and trends is essential in product development. Citrus flavors are popular among consumers for their refreshing and tangy taste profile. Creating citrus electrolyte drinks can cater to this preference and potentially expand the market reach of such products.

Convenience: Electrolyte drinks provide a convenient way to replenish fluids and electrolytes on the go, whether during sports activities, travel, or everyday life. Citrus flavors can enhance the convenience factor by offering a portable and readily accessible option for hydration and replenishment.

Ingredients:

- Fresh Orange Juice.
- Fresh Lemon Juice.
- Filtered Water or Coconut Water.
- Organic raw Honey or Organic maple syrup.
- Himalayan pink salt.

Research Methodology:

Define the Research Objective:

- Determine the specific aspects of citrus electrolyte drinks you want to study (their impact on hydration, performance, taste preferences, etc.)
- Clarify the research questions to guide the study.

Literature Review:

Review existing literature on citrus electrolyte drinks, including:

- Previous research studies.
- Nutritional content.
- Consumer preferences.
- Market trends.

Hypothesis Formulation:

- Based on the literature review and research objectives, formulate clear hypotheses regarding the effects or characteristics of citrus electrolyte drinks.

Participant Recruitment:

- Recruit participants who fit the study criteria.
- Obtain informed consent from participants.

Conclusion and Discussion:

- Summarize the findings.
- Discuss implications of the results in relation to the research objectives.
- Address limitations of the study and suggest areas for further research.

Required Test:

- Microbial Test
- Brix
- TA (Tractable acidity)
- P^H
- Inverted Brix
- Turbidity Test

Outcomes of the work:

Formulation Development: Researchers may have developed new formulations for citrus-flavored electrolyte drinks, aiming to optimize taste, electrolyte balance, and nutritional content. **Taste Testing:** Evaluation of consumer preferences and sensory attributes through taste testing and sensory analysis to ensure the drink is palatable and appealing to the target market.

Quality Control: Establishment of quality control measures to ensure consistency and safety in the production of citrus electrolyte drinks, including measures to monitor ingredient sourcing, production processes, and packaging.

Health Benefits: Investigation into the potential health benefits of consuming citrus electrolyte drinks, such as improved hydration, electrolyte balance, and performance outcomes compared to other beverages.

Overall, the outcomes of work on citrus electrolyte drinks aim to deliver a product that is not only effective in supporting hydration and electrolyte balance but also meets consumer preferences and regulatory standards while offering potential health and performance benefits.

Conclusion: In conclusion, citrus electrolyte drinks are an effective and convenient solution for maintaining hydration, replenishing electrolytes, and supporting overall performance during physical activity. However, it's essential to consume them as part of a well-balanced diet and consider individual hydration needs and preferences.

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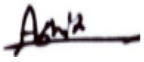
Daffodil International University

Applicant



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Department of NFE, DIU